

**PATENT APPLICATION**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Naotaka AKIWA

Application No.: New U.S. Patent Application

Filed: December 14, 2001

Docket No.: 111477

For: STEPPING MOTOR, STEPPING MOTOR DEVICE AND DRIVING METHOD  
THEREOF

**PRELIMINARY AMENDMENT**

Director of the U.S. Patent and Trademark Office  
Washington, D. C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

**IN THE CLAIMS:**

Please replace claims 4-7 as follows:

4. (Amended) A stepping motor according to any one of claim 1, wherein the arc-shaped deformation preventing groove is provided along the circumference at the side end contacting the base to which the stepping motor is mounted.

5. (Amended) A stepping motor according to any one of claim 1, wherein the rotor is provided opposing the stator magnetic poles on a rotor yoke secured to the rotating shaft and a notch is provided in the rotor yoke in order to leak magnetism of the rotor,  
further comprising a leakage flux detector for detecting leaking magnetic flux from the rotor, the leakage flux detector provided in a position opposing the notch.

6. (Amended) A stepping motor according to any one of claim 1, further comprising a leakage flux detector for detecting changes in magnetic poles, the leakage flux detector provided on a cylinder end surface of a cylindrical permanent magnet provided in a cylindrical shape opposing the stator magnetic poles on the rotor yoke secured to the rotating

shaft.

7. (Amended) A stepping motor according to claim 5, further comprising a rotary polygon mirror secured to the rotating shaft which is rotatably provided through the cylindrical bearing holder vertically mounted on the base to which the stepping motor is mounted, which rotates along with the rotating shaft, the rotary polygon mirror provided on the outer periphery of the rotor yoke with each mirror surface corresponding to a magnetic pole of the rotor of the stepping motor.

Please add new claims 11-20 as follows:

--11. A stepping motor according to any one of claim 2, wherein the arc-shaped deformation preventing groove is provided along the circumference at the side end contacting the base to which the stepping motor is mounted.--

--12. A stepping motor according to any one of claim 3, wherein the arc-shaped deformation preventing groove is provided along the circumference at the side end contacting the base to which the stepping motor is mounted.--

--13. A stepping motor according to any one of claim 2, wherein the rotor is provided opposing the stator magnetic poles on a rotor yoke secured to the rotating shaft and a notch is provided in the rotor yoke in order to leak magnetism of the rotor, further comprising a leakage flux detector for detecting leaking magnetic flux from the rotor, the leakage flux detector provided in a position opposing the notch.--

--14. A stepping motor according to any one of claim 3, wherein the rotor is provided opposing the stator magnetic poles on a rotor yoke secured to the rotating shaft and a notch is provided in the rotor yoke in order to leak magnetism of the rotor, further comprising a leakage flux detector for detecting leaking magnetic flux from the rotor, the leakage flux detector provided in a position opposing the notch.--

--15. A stepping motor according to any one of claim 4, wherein

the rotor is provided opposing the stator magnetic poles on a rotor yoke secured to the rotating shaft and a notch is provided in the rotor yoke in order to leak magnetism of the rotor,  
further comprising a leakage flux detector for detecting leaking magnetic flux from the rotor, the leakage flux detector provided in a position opposing the notch.--

--16. A stepping motor according to any one of claim 2, further comprising a leakage flux detector for detecting changes in magnetic poles, the leakage flux detector provided on a cylinder end surface of a cylindrical permanent magnet provided in a cylindrical shape opposing the stator magnetic poles on the rotor yoke secured to the rotating shaft.--

--17. A stepping motor according to any one of claim 3, further comprising a leakage flux detector for detecting changes in magnetic poles, the leakage flux detector provided on a cylinder end surface of a cylindrical permanent magnet provided in a cylindrical shape opposing the stator magnetic poles on the rotor yoke secured to the rotating shaft.--

--18. A stepping motor according to any one of claim 4, further comprising a leakage flux detector for detecting changes in magnetic poles, the leakage flux detector provided on a cylinder end surface of a cylindrical permanent magnet provided in a cylindrical shape opposing the stator magnetic poles on the rotor yoke secured to the rotating shaft.--

--19. A stepping motor according to any one of claim 5, further comprising a leakage flux detector for detecting changes in magnetic poles, the leakage flux detector provided on a cylinder end surface of a cylindrical permanent magnet provided in a cylindrical shape opposing the stator magnetic poles on the rotor yoke secured to the rotating shaft.--

--20. A stepping motor according to claim 6, further comprising a rotary polygon mirror secured to the rotating shaft which is rotatably provided through the cylindrical

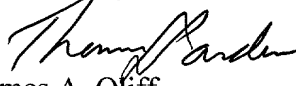
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bearing holder vertically mounted on the base to which the stepping motor is mounted, which  
rotates along with the rotating shaft, the rotary polygon mirror provided on the outer  
periphery of the rotor yoke with each mirror surface corresponding to a magnetic pole of the  
rotor of the stepping motor.--

REMARKS

Claims 1 - 20 are pending. By this Preliminary Amendment, claims 4-7 are  
amended to remove multiple dependencies. Claims 11-20 are added to compensate for the  
material deleted from claims 4-7. Prompt and favorable examination on the merits is  
respectfully requested.

The attached Appendix includes marked-up copies of each rewritten claim (37 C.F.R.  
1.121(c)(1)(ii)).

Respectfully submitted,



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Attached: Appendix  
Date: December 14, 2001

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## APPENDIX

## Changes to Claims:

Claims 11-20 are added.

The following are marked-up versions of the amended claims:

4. (Amended) A stepping motor according to any one of claim ~~1s 1 to 3~~, wherein the arc-shaped deformation preventing groove is provided along the circumference at the side end contacting the base to which the stepping motor is mounted.
5. (Amended) A stepping motor according to any one of claim ~~1s 1 to 4~~, wherein the rotor is provided opposing the stator magnetic poles on a rotor yoke secured to the rotating shaft and a notch is provided in the rotor yoke in order to leak magnetism of the rotor, further comprising a leakage flux detector for detecting leaking magnetic flux from the rotor, the leakage flux detector provided in a position opposing the notch.
6. (Amended) A stepping motor according to any one of claim ~~1s 1 to 5~~, further comprising a leakage flux detector for detecting changes in magnetic poles, the leakage flux detector provided on a cylinder end surface of a cylindrical permanent magnet provided in a cylindrical shape opposing the stator magnetic poles on the rotor yoke secured to the rotating shaft.
7. (Amended) A stepping motor according to claim ~~5 or 6~~, further comprising a rotary polygon mirror secured to the rotating shaft which is rotatably provided through the cylindrical bearing holder vertically mounted on the base to which the stepping motor is mounted, which rotates along with the rotating shaft, the rotary polygon mirror provided on

the outer periphery of the rotor yoke with each mirror surface corresponding to a magnetic pole of the rotor of the stepping motor.